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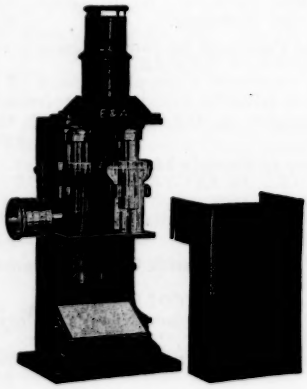

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HIGHER ENDEAVOR IN SCIENCE[1]

PHILADELPHIA, Princeton and Menlo Park are the beginning, the middle, and the end of a tiny strip of territory which is the cradle of American history. No other spot in the vast territory of these United States reminds us of so many great historical events. No names of Americans remind us of so many great events in the history of American science as the following names: Benjamin Franklin, of Philadelphia, Joseph Henry, of Princeton, and Thomas Edison, of Menlo Park. Just as the achievements of the continental congresses in Philadelphia, and Washington's victories at Trenton and Princeton laid the foundation of these United States, so the scientific achievements of Franklin, of Joseph Henry and of Edison laid the foundation and added some of the superstructures of earlier American science.

The tiny state of New Jersey and the tiny strip of its territory on which we are standing to-day can justly claim the lion's share of the glory of these great achievements. The Battle Monument at Princeton, speaking in accents modulated by the chisel of Macmonnies, tells the story of a great victory; these buildings the cornerstones of which we are laying to-day will be monuments which will tell a wonderful story of great achievements in American science and of a victory which was one of the crowns of these achievements. This victory, just like that of the battle of Princeton, was won right here at Princeton. It is seemly that on this memorable occasion I recite a bit of this story.

Prior to Franklin's time the natural philosopher riveted his attention upon electricity at rest. Franklin's discovery that lightning is a motion of electricity revolutionized the mental attitude of the natural philosopher of Franklin's time, and motion of electricity became the favorite subject of his inquiry. Just as during the century preceding Franklin the genius of Galileo and of Newton had revealed a new universe, the universe of matter moving in obedience to simple laws, so during the century which Franklin's discovery inaugurated a new universe was revealed; it is the universe of electricity in motion obeying simple laws of electrical action. The discovery and formulation of these laws are the greatest scientific glory of the century which began with Franklin's discovery.

[1] Address on the laying of the cornerstones of an engineering building and a chemical laboratory at Princeton University, on May 12, 1927.

Joseph Henry's discovery of the inertia of electricity is one of the greatest contributions to the glory of this remarkable century. His great electro-magnet which gave birth to this discovery is still here in Princeton. Grateful science, recognizing the eminent value of this work, named the unit of electro-magnetic inertia after Henry, and thus assigned to him a place of honor in the Hall of Fame of Science. In this Hall of Fame is the Valhalla where Joseph Henry and other immortals like Volta, Ohm, Ampère and Faraday dwell. Just think of it! Princeton, a little village in a little state, represented by Henry among the immortals in the Valhalla of Science. Think of it, and it will recall to your mind another glorious picture, the picture of little Cambridge represented by Newton in the same Valhalla of Science.

Just as the spirit of Newton has been the scientific spirit of Cambridge during the last two hundred years, so the spirit of Joseph Henry has been the scientific spirit of Princeton during the last hundred years. That transformed little Cambridge and little Princeton into mighty cities in the world of science.

What is that spirit of Princeton which is guided by the spirit of Joseph Henry, the patron saint of Princeton's science? It is not as generally known as it ought to be that Joseph Henry is the inventor of the electromagnetic telegraph which he, nearly a hundred years ago, operated between his house and his laboratory here at Princeton. This was the beginning of the present art of electrical communications which enables us to-day to speak at any time to any person in the United States. Would that Washington and Lincoln could have foreseen this new power for the consolidation of the American Union! Henry knew the practical value of his invention, but that did not divert him from the pursuit of a new truth the vision of which appeared to him in the activities of moving electricity. He let the practical men like Wheatstone and Morse develop the practical applications of his electromagnetic experiments; he worshipped at the temple dedicated to the eternal truth of science, and there he found the revelation of the inertia of moving electricity, a new glimpse of the eternal truth never caught before by the eye of man. There he found the immortality which gave him a place in the Valhalla of Science. This devotion to the eternal truth and scientific idealism was the expression of Joseph Henry's spirit. It manifested itself in all his work at Princeton and later in his scientific leadership as secretary of the Smithsonian Institution and as president of the National Academy of Sciences. He, assisted by his personal friend, immortal Lincoln, organized the National Academy and with the aid of its distinguished members he inaugurated, sixty years ago, the historic movement for higher endeavor in American science. Higher endeavor in science was Henry's motto, and it was also the motto of Young and Brackett, and of all the scientists of Princeton of former days and of to-day. Higher endeavor in philosophy was the motto of McCosh, president of Princeton, when sixty years ago he, a Presbyterian clergyman, lectured on evolution. The scientific spirit of Princeton inspired this brave and extraordinary gesture. Loyal to the spirit of Joseph Henry, its patron saint in science, Princeton to-day just as in the days of McCosh worships at the altar of scientific idealism, of fearless and of unselfish devotion to the eternal truth. Princeton's mission is to cultivate this idealism and make it effective in the life of the American democracy.

No elaborate statistical figures are needed to demonstrate the value of higher endeavors in science. Every industry in the land recognized this value long ago. The practical value of the eternal truth is known to-day to the practical man just as its spiritual value was known to the prophets of several thousand years ago. The same eternal truth which according to the prophets promises spiritual freedom promises to-day economic freedom also. American industries are craving to-day for the revelation of scientific truth, and the only problem which faces us to-day is the problem of training our generation in the science and in the art of revealing new scientific truth. Pure science research and the engineering discipline which will apply efficiently the findings of pure science to the development of our industries and of our daily life is now our national motto; it is the motto of our universities as well as of our industries. Scientific research laboratories are springing up on every side in our American industries; they are by universal consent the most effective arms of our national defense. They call for trained men capable of searching for the primordial energies hidden in the mysterious structure of matter. He who has a new glimpse of the eternal truth can unlock these hidden energies and make them willing servants of man, the most powerful defenders of his freedom. These two buildings will be new training camps for such men. The spirit of Princeton's patron saint in science, the spirit of Joseph Henry, will be with them and will guide them just as it has always guided the highest scientific endeavors of Princeton.

The proud citizens of many cities of ancient Greece sacrificed a hundred oxen to the Olympian gods whenever one of their fellow citizens had discovered a new theorem in geometry. Let the proud citizens of the state of New Jersey and the friends of Princeton think of the many revelations in science which appeared here first on the sacred ground on which Nassau Hall stands, and they will find no difficulty

in deciding what sacrifices they should bring to these new altars of the God of eternal truth.

M. I. PUPIN

COLUMBIA UNIVERSITY

THE UNIVERSITY AND MEDICAL EDUCATION[1]

WITHIN a comparatively few years medical education in America has come to be commonly regarded as a function of the university, and the movement in this direction has already progressed so far as to make it unnecessary to discuss the abstract desirability of this tendency. Nor is it any longer necessary to make comparisons between the university and non-university types of medical education. I shall therefore assume that this congress is interested mainly in the use to which the university may be expected to put the rich heritage it has already received, and in the contribution to be made by the university to the improvement of the practice of medicine by improving medical education.

I do not propose to deal at length here with the much-debated question as to whether medicine is to be classified as a science or as an art. Incidentally I may remark, however, that this question is a much older one than is commonly recognized and that much that appears in the current discussions is simply a repetition of what has been actively discussed for many years. Scientific medicine first became self-conscious about the middle of the last century, or a few decades after the universities of Central Europe had consciously adopted research, or increasing the domain of knowledge, as one of their primary functions. It is therefore only natural that long ago there should have occurred, particularly in the middle European countries, active discussion as to the relationship of medicine to science, and as to the function of the universities with respect to medical education.

Naunyn[2] in his inaugural address at the University of Dorpat, in 1869, took as his central theme that "only in science lies the salvation of medicine." Billroth[3] took much the same point of view, and in his classical monograph on the medical sciences summarized most of the discussion which took place up to the beginning of the fourth quarter of the century. In view of the fact that most of what I have to say was current in Germany more than fifty years ago, and since most of it has been repeated at times by many writers during these fifty years, I wish to disclaim any pretense of originality in my remarks to-day.

The union of medical education and the university which has progressed so rapidly in America within the past two decades is in fact, although it has not always been consciously recognized as such, a tacit recognition of the scientific aspirations of American medicine. I propose, therefore, to examine into the further implications of this movement, and to see, so far as I can, what responsibilities the university has for the future, and how we may expect the university to meet them. While recognizing the great responsibility of the university for the advancement of knowledge in medicine, I propose to limit myself to its immediate concern with the education of students in candidacy for the M.D. degree.

It is clear that in taking over the affairs of medical education the university assumes a double function in education, the function of the university and the function of the medical school. The medical school, by tradition and in fact, has the responsibility of furnishing the people with well-trained physicians in sufficient numbers; the university, as such, is concerned only with research and with the conservation and propagation of knowledge, without immediate concern for the use to which its product is to be put. This is an extreme statement of the case, for the purpose of emphasis, but it is well to admit at the outset, as Billroth did,[4] that at times conflicts between these two functions will be inevitable, and that valid objection to the university's conception of its function can and will be made on the basis that "at times too much emphasis may be put on scholarship, at the expense of the practical, sound training, the actual training of the physician."

Since the American university is not a single, well-defined concept, we must expect to find among the individual universities a diversity of attitudes toward these functions. In some, particularly where the immediate responsibility toward the community is more or less fixed, we may expect to find that the attitude of the medical school will dominate. In others, free to follow the dictates of their own conceptions and with future rather than immediate needs in mind, we shall undoubtedly find that the university attitude will determine the course to be followed. I prefer to speak to-day from the standpoint of the university, which, not unmindful of the requirements of the school, will nevertheless conceive of its function in medical education in terms of the university.

This ideal and perhaps idealized university will

[1] An address delivered before the Annual Congress on Medical Education, Medical Licensure and Hospitals, Chicago, February 14, 1926.

[2] Naunyn, S. B., "Errinerungen, Gedanken und Meinungen," Munich, 1925, p. 190.

[3] Billroth, T., "The Medical Sciences in the German Universities" (English translation), New York, 1924.

[4] Billroth, T., *l.c.*, p. 28, p. 92.

adopt Naunyn's belief that "only in science lies the salvation of medicine." And as a corollary it will adopt Mr. Flexner's[5] principle that "if medicine accepts as its goal—however remote that goal may be—scientific standards alike in research and in practice, medical education must be conceived as primarily the effort to train students in the intellectual technique of inductive science." It will follow the dictum of John Stuart Mill[6] who said that "the logic of science is the universal logic, applicable to all inquiries in which men engage." And it will believe with Carlson[7] that the scientific method should, as a conditioned reflex, become a part of the daily thinking and behavior of the student of medicine.

The university will feel that the adoption of these principles will not only be best for the future of medicine, but that in the long run they furnish the soundest basis for the practice of medicine and that the level of practice will consequently be improved. If some of its students are stimulated to enter careers of research, so much the better, but this can not be stated as a primary object of the university in setting its standards. The university will believe, with Billroth[8] that "he (the young doctor) can acquire a sense for scientific training only during his student days, but unfortunately this newly born scientific spirit is often killed outright by the premature development of medical routine. The degree of scientific training and interest imparted to the young man at the university determines his intellectual level for the rest of his life. . . . In the face of these great, culturally invaluable assets it amounts to a mere bagatelle if a young disciple of Aesculapius, confronted with a case which he has properly diagnosed, can not at once recall the formula for the prescription he wished to write, but must look it up in his note book."

But these are merely abstract statements of aims in education. We must know how to attain these aims. How is the method of procedure to differ from that already in use, and if emphasis is to be changed, how is this to be accomplished? How much of that which has been brought into our universities by the formerly independent or loosely affiliated medical schools is being carried on by force of tradition only and should be revised to correspond to university standards in higher education? These are very practical questions to which answers may very properly be demanded.

It is but natural that the first concern of medical education has always been with the teaching of accumulated experience, consisting of facts and theories, or in short the subject-matter of medicine. About this aspect of the teaching of medicine has centered most of the current discussion of the curriculum, and in the presence of an overabundance of subject-matter, which has always confronted medical education, and always will, it is manifestly impossible to determine the ideal subject-matter content of a medical education. That no single formula is universally acceptable is abundantly shown by the diversity of the curricula in various schools—and by the growing tendency to abandon the secondary school type of fixed curriculum which has been brought by the medical schools into the universities.

So far as subject-matter is concerned we need not so much a new curriculum as we need a new attitude towards the curriculum. Whether or not you agree with the German professors who, more than fifty years ago,[9] argued that it is not necessary to cover the entire subject-matter in lectures and that it is sufficient to stimulate the students to pursue his studies independently, it should be apparent that the fixed curriculum is contrary to all principles of higher education and that a freedom of election within the individual university comparable at least with the diversity of subject-matter taught in various medical schools, and by various instructors in the same subject, could be adopted by any university without endangering the structure of medical education. The present system approaches an absurdity when a new course is offered within a medical school, and attendance upon this course is immediately required of all students.

The quiz compend and the recitation course have been prominent in medical education. They are disappearing, but they still exist. They are pernicious and subversive to the achievement of the aim we have stated, and their only object is to cram facts into students. They have no place in the university school of medicine. But the quiz compend and the recitation course are only examples of the overemphasis on subject-matter which is characteristic of our medical schools. The first duty of the university is to shift the emphasis from subject-matter to the intellectual processes of the student. In the words of William Stokes[10] "let us labor to place the teaching of medicine in its true position. Let us emancipate the student, and give him time and opportunity for the cultivation of his mind, so that in his pupilage he shall not be a puppet in the hands of others, but rather a self-relying and reflecting being. Let us ever foster the general education in preference to

[5] Flexner, A., "Medical Education," New York, 1925.

[6] Mill, John Stuart, "System of Logic," Book III, Chapter I.

[7] Carlson, A. J., "Research as a Method of Education," SCIENCE, 1927, lxv, 125–128.

[8] Billroth, T., *l.c.*, p. 92.

[9] Quoted by Billroth, T., *l.c.*, p. 43.

[10] Quoted by Cole, R., SCIENCE, 1920, li, 329–340.

the special training, not ignoring the latter, but seeing that it be not thrust upon a mind uncultivated or degraded. Let us strive to encourage every means of large and liberal education in the true sense of the term and so help to place and sustain our noble profession in the position which it ought to occupy."

I am not speaking against the acquisition of facts, for only with knowledge can the intellectual processes act, and the practice of a profession is impossible without a body of knowledge. That within a university school of medicine there should be conserved and taught the whole subject-matter of medicine goes, perhaps, without saying. But that this can all be condensed to fit into a four years' curriculum is manifestly impossible. Further, I submit that the body of knowledge in use by any practitioner is a constantly shifting structure, and that such knowledge as is acquired or can be acquired by the student during his medical course bears only a slight relationship to that which he acquires and puts to use in later life.

As an extreme example of the opposite point of view I shall relate the following incident. The one thing I recall of a certain lecture course I attended on Saturday afternoons during my third year in medical school is a statement made by the instructor to the remainder of his class on an occasion when the majority had deserted in favor of a football game. More in sorrow than in anger he related that he owed his helplessness in a constantly recurring emergency to the fact that when a student in medical school, some thirty years before, he had unavoidably missed the lecture given on this subject and that he had never been able to repair the resulting deficiency in his knowledge. That I remember this, and do not remember one more thing that was told us in that same course is perhaps not without significance.

My ideal university would drop the attempt to establish a fixed curriculum and would eliminate or bring to a minimum all required courses. It would recognize the fact that the subject-matter necessary for the practice of medicine may be acquired in any of a great number of ways, and within certain very wide limits it would allow the student freedom of election of courses in the belief that he will develop both his intellectual powers and his knowledge of medicine more rapidly if allowed to select courses which arouse his curiosity and interest, instead of being forced to learn facts in a predetermined order. In the interest of the public it would naturally safeguard the M.D. degree, which has come to mean fitness for the practice of medicine, but it would design safeguards to operate at the time the degree is to be conferred, rather than to depend on the results of examinations given so long before the degree that they no longer serve as an indication of the qualifications of the student.

But a change in attitude toward subject-matter meets only in part the problems we face. I have already indicated that the primary concern of the university is with the intellectual processes of the student. To an important extent this has to do with the processes of reasoning, and unless the university can train students to think logically it has failed at the outset. But the matter goes even deeper than that, for logical reasoning in itself is not sufficient in a subject so complicated as medicine, for the reason that in a subject where so many assumptions have to be made, conclusions reached on the basis of reasoning alone are more than apt to be fallacious.

The physician must compare and weigh evidence, and if possible must submit his tentative conclusions to critical tests and be ready to start anew if the evidence be against them. These are the methods of science, and either in practice or in research they must be used by the student of medicine. And the obvious way in which a student can acquire the methods of science, by which I mean not the technique of complicated laboratory methods but the intellectual technique of science, is by taking part in scientific investigations. This thesis has recently been advanced and elaborated by Carlson[11] in his address on "Research as a Method of Education," and it has been advocated by President Mason as "education by participation in research." The student may gain some insight into the scientific method by repeating, as Cole[12] suggests, the important steps which have led to the present knowledge of at least one disease. But this method will at the best acquaint him only with the successes in investigation, and not with the failures and disappointments. How much better it would be to have him take some part, however small, in new investigations actually in progress. This will give him insight into the methods and intellectual processes involved in arriving at the truth, and will give him first-hand contact with the difficulties and pitfalls inherent in the attempt to advance knowledge.

This method of education, which to be successful should be practiced as early and as continuously as possible during the student's progress through his courses in medicine, will also give him one other asset of first importance to him in his later life—a sense of the sources and limits of error in the methods of medicine, without which he can not expect to use these methods fruitfully and intelligently either in practice or in research. Just as the student of chemistry can not become a good analytical chemist

[11] Carlson, A. J., *l.c.*

[12] Cole, R., *l.c.*

until he has learned from his own experience the sources and limits of error in the methods he is to use, just so the student of medicine can not become a good physician until his consciousness is fully awakened to the limitations of the methods he is to use in diagnosis, prognosis and treatment, and to the steps necessary for the safeguarding of the accuracy and the validity of his conclusions.

We have already indicated that the processes of thought needed by the physician in his daily life, *i.e.*, in the diagnosis, prognosis and treatment of disease, are the same processes involved in what we have called the scientific method. As a corollary of this it follows that it should be possible to teach the methods and the limitations of medicine on the basis of clinical problems—problems which are not new but which are new to the student. This is undoubtedly true, but it is a matter which requires conscious effort on the part of the teachers. If the student enters the clinic and finds the same attitude toward the problems of medicine which he has heretofore encountered with respect to the problems of physiology; if he finds conclusions arrived at as carefully and as guardedly as in chemistry; if he finds the same attention to the submission of conclusions to critical tests, and to control at autopsy, there is no reason, except the necessity inherent in clinical medicine for frequent immediate action on the basis of rules formulated on the basis of experience, why his clinical training should not give him the same point of view and the same critique which he would acquire through scientific experimentation.

John Stuart Mill, in his "System of Logic,"[13] in speaking of the rules of art in general says:

> By a wise practitioner rules of conduct will only be considered as provisional. Being made for the most numerous cases, or for those of most ordinary occurrence, they point out the manner in which it will be least perilous to act, where time or means do not exist for analyzing the actual circumstances of the case, or where we can not trust our judgment in estimating them. But they do not at all supersede the propriety of going through (when circumstances permit) the scientific process requisite for framing a rule from the data of the particular case before us.

If the student, on beginning his study of clinical medicine, finds that his teachers, no matter how expert they may be in the art of diagnosis, do, when circumstances permit, go through the scientific process requisite for framing rules from the data of the particular cases before them, he will have the beginning of a sound basis for his career in practice. It is therefore extremely important that the student should have his first contacts with clinical work under auspices where the principles which he has been taught are carried into practice. One of the real weaknesses of medical education has been the carrying on of slipshod methods in dispensaries, and bringing students into their first contact with clinical work in such an atmosphere. As Billroth says:[14]

> The hasty diagnoses and prescriptions in a dispensary furnish the student an opportunity to develop a certain skill in diagnosis and to learn how to make rapid examinations. But this medical routine, which greatly impresses the public and at first the student as well, is only of relative value, and, as the student is sure to learn later, has little worth as scientific training, even though it may make the task of the young doctor easier at the beginning of his practice. Most doctors learn routine all too quickly in the course of their practice; he who begins to acquire it as a student becomes so accustomed to superficial examinations, superficial thinking and superficial treatment, that he is easily spoiled for all serious and penetrative research into a diseased condition. Any quick-thinking person can acquire routine easily and rapidly if he so desires, whereas most persons must be painstakingly trained to careful, meditative, searching thought on the more difficult processes.

The same principle applies of course to the work of the student in the hospital, but fortunately our hospitals have been as a rule much better conducted than our dispensaries. The university's responsibility in this matter, for the dispensaries and hospitals under its control, is clear. The university can go no further with the art of the practice of medicine than to introduce the student to clinical work in order to give him what Cole calls "a final polish by a preceptor system correctly applied." That the preceptor system be correctly applied is of vital importance.

It may appear that the goal in medical education which I have outlined is an impossible one. This is certainly true to the extent that it will, in practice, never be quite attained either by the university or by the student. The success of the university in securing a teaching staff with the requisite vision, energy and patience will be variable, and as to the students, only a few will be able to reap the maximum benefits. But with the goal clearly before it the university should be able to move forward with greater certainty and speed. It should produce better equipped doctors and a greater number of physicians who have their potential capabilities fully developed and who in turn will hasten the conquest of ignorance and superstition.

FRANKLIN C. MCLEAN

UNIVERSITY OF CHICAGO

[13] Mill, John Stuart, "System of Logic," Book VI, Chapter XII.

[14] Billroth, T., *l.c.*, p. 31.

CARL H. EIGENMANN

CARL H. EIGENMANN, who died April 24 at Coronado, California, was born in Flehingen, Germany, March 9, 1863. He came to this country when a boy of 17, and located at Rockport, Indiana. Two years later he entered Indiana University, where he graduated in 1886. He remained the next year for graduate study and was given the A.M. degree. He was married to Rosa Smith, of San Diego, California, August 20, 1887, and together they spent the next year at Harvard studying fishes. He was given the Ph.D. degree under Jordan in 1889. The next two years were spent in collecting fishes for the British Museum in western United States and Canada. He was made professor of zoology at Indiana University in 1891 at the time Jordan left for Stanford. In 1908 when the graduate school was organized, he was made dean. In addition to these positions he was curator of fishes in the Carnegie Museum, Pittsburgh, from 1909 to 1918. In 1895 he established a fresh-water biological station in northern Indiana, and remained as its director until a few years before his death.

In order to collect materials for a study of degenerative evolution in the blind vertebrates, he made expeditions to the cave regions of Indiana, Kentucky, Missouri, Texas and Cuba. For a study of fishes he made four trips to South America and sent students on other expeditions.

His contributions to zoology number more than 200. His fellow scientists have spoken concerning the worth of these by electing him to membership in the National Academy of Sciences, the American Philosophical Society, and other societies. While most of his contributions were concerned with taxonomic studies of fishes, his interests were not limited to this field. His study on the germ cells of Cymatogaster was a pioneer piece of work on the origin and segregation of these cells in the vertebrates. At the time he established the biological station, his interests were in the field of variation. In fact that was one of his main reasons for starting a station. The rediscovery of Mendelism in 1900 put an end to such studies and he turned to the cave vertebrates. His study of degenerative evolution stands as a monumental piece of work. At that time he was convinced that the Lamarckian principle was a factor in evolution. In later years when the evidence became overwhelming in the opposite direction he generously changed. His studies of the South American fish fauna were planned in his younger days but were not executed until after the completion of his work on cave forms. Perhaps a man who has never worked in this field is not competent to judge such work, but if I were to venture an opinion, I should say that they place him in the first rank of ichthyologists of all time. It is very unfortunate that he was not permitted to complete the comprehensive studies he had planned and undertaken.

It is interesting to know that Dr. Eigenmann entered college with the intention of studying Latin and Greek. Uninspiring teachers in these subjects and contact with Jordan turned him toward zoology and particularly the fishes.

While Dr. Eigenmann's main interests were in research and while he spent most of his time and energy in doing research he was an inspiring teacher. This is clearly shown by the many students who have continued to follow zoology as their life-work. Perhaps in the strictly pedagogical sense he was a failure as a teacher because his one fundamental method was to let the student find things for himself. There was often much floundering around and loss of time but if the student finally arrived he knew how he got there and incidentally had learned something about how to get to the next place. His attitude was not one of indifference toward the student but he used this method because he believed it the best. His interest in his students did not end the moment they left him. He always kept their future interests in mind and when vacancies arose he asked for the graduates who could fill the place. Another of his good qualities as a teacher was his confidence in the student. He believed he could cause a student to strive harder to make good by giving him more than he was actually worth than by giving him less than he was worth and applying the prodding iron. He applied the same method to the younger men in his department. He assigned them a task and left them to sink or swim. By this method he showed his confidence in their ability to accomplish results. Here, as with the student, the method worked. As an associate within his department, Dr. Eigenmann was very exceptional. The work was divided and each was expected to do his part without supervision. While he was head of his department things were managed in a democratic way. Seldom was anything done without consultation with his staff. In fact during the last twelve years of his life he took little part in the management of his department. More than this he always lent his help and encouragement in every way possible, particularly for the advancement of research.

As a man he was, as one of his friends once said of him, a human being. With all his intense interest in his work he always had time to talk to a student or a colleague. It is true that the conversation might end in fishes. Always there was a ready wit, a

sparkle in the eye and a good story. These latter qualities made him an interesting lecturer and were valuable aids in the search for funds for his scientific expeditions. He was a man of determination. It was this characteristic which added to his interest and zeal and carried him through the immense amount of work which he did. He was a fighter for what he believed to be the right. This was demonstrated again and again in the working out of university problems.

I think it should also be said that while on his scientific expeditions to South America and Cuba he always tried to further the friendly relations of those countries and the United States and, I think, to some extent succeeded.

FERNANDUS PAYNE

INDIANA UNIVERSITY,
BLOOMINGTON

THE death of Dr. Carl H. Eigenmann removes one of the most eminent workers in the field of systematic zoology and one of the ablest of natural history teachers, withal the most tireless of explorers.

He was born at Flehingen, Germany, in 1863. In 1865 he came to Rockport, southern Indiana, with an immigrant uncle, and worked his way upward to the State University of Indiana, when he proposed to study law. In his second year in college the old classical course was modified, and students in sophomore Latin were allowed to substitute natural science for the required subject. To the surprise of the professor of Latin it was his best and not the weakest students who took advantage of this breach of tradition. Of these, Carl Eigenmann was the leader. His work was of the highest order, and he soon adopted ichthyology as his specialty, becoming later instructor in zoology under Dr. Jordan; and when Dr. Jordan, with Professor Gilbert, left Indiana in 1891 for Stanford University, he appointed Eigenmann professor of zoology, which position he held for the rest of his life, becoming later dean of the graduate school.

In Indiana, Eigenmann was a vigorous and inspiring teacher of science, leading many of his students to do original work.

He soon carried out on a large scale a detailed exploration of the prodigious fish fauna of the Amazon and ultimately of the other rivers of Brazil. His collections of fishes from this region soon outnumbered all others put together. Before returning to Indiana, Eigenmann was curator of fishes in the California Academy of Sciences and later in the Museum of San Diego. In that city he married Rosa Smith, a fellow student in Indiana, and the author of some notable papers on fishes. In 1888 his great series of papers on Brazilian fishes was begun at Harvard University where he was enabled to study the enormous and not exaggerated collections made by Professor Agassiz. This paper and seven others, mostly on Brazilian materials, were joint products of himself and his wife, being recorded as "Eigenmann and Eigenmann." On his return as instructor to Indiana a number of reviews of leading families of fishes were published by Jordan and Eigenmann. In 1894, his personal explorations in Brazil began, to be continued as time and funds permitted for the next twenty years. In this work various students assisted. A remarkable feature was the fact that he never failed to receive offers of help from business men who found out what he was trying to do. He made apparently little effort to get such help, but as in Agassiz's case, there were men "not willing to see so brave a man struggle without aid." A reason for such assistance lay in Eigenmann's plain, unaffected earnestness, and the total absence of any disposition to pose.

By 1904, the work of exploration was well under way and in 1908 it was taken up and supported by the Carnegie Museum at Pittsburgh, when Eigenmann, without leaving the faculty of Indiana, became curator of fishes, adding hundreds of species to the treasures of that museum. This relation was maintained until about 1922. In all, 155 new genera were defined by Eigenmann and his students, 35 by Eigenmann and Eigenmann, and 5 by Jordan and Eigenmann, making a total of 195 new genera, containing about 600 species. Eigenmann's technical papers number upwards of 170. One of the most important is the study of the blind cave-fishes of North America. Of most of the scientific societies of this country he was a member.

Eigenmann was an excellent teacher, a clear-eyed observer, with persistence and energy of the highest rank. Plain and direct, genial and kindly in all his relations, though with no special effort at elegance, he held the affection and respect of his colleagues and students.

In stature, Eigenmann was of medium height, stoutly built and of sturdy, though not distinguished appearance. He enjoyed robust health until his last two years, when he was somewhat broken as a result of mosquito-borne fevers of the torrid zone.

His wife and four children, three sons and one daughter, survive him.

DAVID STARR JORDAN

SCIENTIFIC EVENTS

INSTITUTE OF PACIFIC RELATIONS

IN the summer of 1925, one hundred and forty unofficial representatives from eight countries met

in Honolulu for a consideration of the racial, political, economic and social problems of interest to nations bordering the Pacific. The apparent cultural conflict between the East and the West was frankly discussed. The conference came to more than one impasse but succeeded in opening windows into new racial backgrounds. The meetings were given over wholly to fact finding; the main Pacific issues were defined but no solutions were offered. It was realized that present knowledge of Pacific peoples and natural resources is quite inadequate for intelligent conclusions regarding desirable commercial and cultural relations. With a view to gaining fuller knowledge the representatives of the conference organized the Institute of Pacific Relations.

The institute is an unofficial body with constituent branches in seven of the countries in and bordering the Pacific Ocean, organized under an international council with headquarters in Hawaii.

The institute aims to serve in the field of social sciences in the Pacific much as the Pacific Science Association serves in the field of pure science. A practical liaison is effected between the two bodies through the presence of some of the same officers on the executives of both bodies and the recognition of the supplementary rôle that they play in the Pacific.

Its purpose is to provide a means for the interchange of opinion and discussion of the chief conflicting issues of the Pacific area, by the assembling of data to throw light upon them and to bring such data and other pertinent information to the attention of the people of the various countries.

For carrying out its aims the institute provides for (a) biennial conferences, at which selected representatives appointed by the participating branches meet for discussion; (b) research into questions of mutual concern of the Pacific peoples, such as food-supply, population, immigration, and culture conflicts, carried on by groups of specialists in the various branches; (c) interchange of research findings and more general facts bearing upon Pacific relationships aimed at increasing the understanding of the peoples of this area of one another.

The National Councils of the Institute command notable leadership, *viz.*, Sir Mungo McCallum, vice-chancellor of the University of Sydney, for Australia; Sir Robert L. Borden, for Canada; Dr. David Yui, for China; Hon. Junnosuke Inouye, former finance minister, for Japan; Sir James Allen, retiring commissioner to London, for New Zealand; Mr. F. C. Atherton, for Hawaii; and the late President Ray Lyman Wilbur, of Stanford University, for the United States. These branch officers constitute the Pacific Council, which is the governing body of the institute. President Wilbur was chairman of this council for the period 1925–1927. Associated with these leaders in each national group are outstanding representatives of the universities, the press, business, labor, and social and religious activities.

The National Social Science Research Council of America is cooperating with the American branch of the institute through a committee on international research created especially for this purpose. Dr. James T. Shotwell, of Columbia University, is chairman of this committee.

Preparations are well advanced for the second conference of the institute, which will be held in Honolulu, July 15–29, 1927. In addition to notable delegations from the seven constituent branches, representatives are expected to attend from England and several of the chief island groups of the Pacific. The agenda will include such topics as food supply, population, immigration, effects of entrance of Western culture into Asia, race prejudice, communications, industry, labor, standards of living, and international finance and education.

The institute issues monthly a *News Bulletin* as a medium of exchange of information and news related to its field.

Mr. Frank C. Atherton is chairman of the central executive committee in Hawaii. The address of the Central Secretariat is McCandless Building, Honolulu.

AWARD OF PRIZES BY THE AMERICAN MEDICAL ASSOCIATION FOR SCIENTIFIC EXHIBITS

THE committee on awards of the American Medical Association, consisting of Drs. P. M. Hickey, Guy C. Lane, Phillip Marvel, Dallis P. Phemister and Ludwig Hektoen, *chairman*, have made the following awards for exhibits and demonstrations made at the recent meeting of the association in Washington:

Gold Medal:

To F. W. HARTMAN, ADOLPH BOLLIGER and H. P. DOUB, Henry Ford Hospital, Detroit, for the great significance and excellence of presentation of exhibit on cardiodrenal and cardiac studies, illustrated with specimens showing heart and kidney lesions produced by deep roentgen rays.

Silver Medals:

To CHEVALIER JACKSON, Philadelphia, for exhibit showing household accidents to children, and their prevention.

To HIDEYO NOGUCHI, Rockefeller Institute for Medical Research, New York, for exhibit illustrating studies of Oroya fever; verruga peruana and trachoma.

Bronze Medals:

To VILRAY P. BLAIR, St. Louis, for an exhibit on

plastic surgery, dealing with the retracted upper lip and nose.

To W. M. JAMES, L. B. BATES, L. GETZ and J. J. VALLARINO, Medical Association of the Isthmian Canal Zone from the Ancon, Santa Tomas and Panama Hospitals, for an exhibit illustrating the diagnosis, etiology and pathology of infection with E. histolytica.

Certificates of Merit:

To H. J. CORPER, National Jewish Hospital for Consumptives, Denver, for an exhibit illustrating the cultivation of tubercle bacilli and the organic reaction to tuberculosis.

To HOWARD FOX, New York, for an exhibit on the fungus diseases of the skin and the excellence of demonstration.

To A. H. MCINDOE and V. S. COUNSELLOR, Mayo Clinic, Mayo Foundation, Rochester, Minn., for an exhibit illustrating pathologic conditions of the liver in corrosion specimens.

To BERNARD H. NICHOLS, Cleveland Clinic, Cleveland, for roentgenographic exhibit illustrating normal and abnormal positions of the aorta.

To ERNEST SCOTT and R. A. MOORE, Ohio State University, Columbus, for exhibit illustrating pathologic anatomy of the kidney.

To BENJAMIN TERRY, Nashville, for exhibit of a new stain and method in tissue microscopy and excellence of demonstration.

The committee also gives honorable mention to the following:

FLORENCE E. AHLFELDT, Philadelphia, for exhibit illustrating coccidioidal granuloma.

ATHUR J. BEDELL, Albany, for exhibit of photographs of the living eye.

JANET CALDWELL and GEORGE T. CALDWELL, Dallas, for exhibit illustrating bacteriophage.

C. L. KARRENBERG, Hamburg, Germany, for exhibit illustrating fungi and fungus diseases as met in Europe.

THE NATIONAL MUSEUM OF ENGINEERING AND INDUSTRY

THE National Museum of Engineering and Industry held its third annual meeting at its headquarters in the Engineering Societies Building, New York City, on Thursday afternoon, April 28.

Preliminary to the meeting the members tendered a luncheon at the adjoining Engineers Club to the presidents and secretaries of the following societies who were represented on its board of trustees:

American Society of Civil Engineers
American Institute of Mining and Metallurgical Engineers
American Society of Mechanical Engineers
American Institute of Electrical Engineers
United Engineering Society
Engineering Foundation
Engineers Club
American Engineering Council
Society for the Promotion of Engineering Education
American Chemical Society
American Association for the Advancement of Science

The Smithsonian Institution of Washington, D. C., of which the National Museum of Engineering and Industry will be a part, and the Museums of the Peaceful Arts of New York City, were also represented.

The following trustees were elected:

Mr. L. P. Alford, B. C. Batcheller, George M. Bond, Nicholas F. Brady, Ericsson F. Bushnell, Fred H. Colvin, F. A. Halsey, Thomas T. Hoopes, Professor D. C. Jackson, Joseph Keller, Fred R. Low, H. P. Merriam, H. F. J. Porter, Dr. M. I. Pupin, Dr. Elmer A. Sperry, Kirby Thomas, F. A. Waldron.

Mr. Thomas Ewing, former Commissioner of Patents, is president, and Mr. Harrison W. Craver, librarian, United Engineering Societies Library, secretary.

APPOINTMENT OF FELLOWS IN MEDICINE BY THE NATIONAL RESEARCH COUNCIL

AT a meeting of the medical fellowship board of the National Research Council on April 30, the following fellows were appointed:

Name	Location	Subject
Walter Bauer, M.D. Mich. 22.	London Dale.	Internal Medicine.
Detlev W. Bronk, A.B.; M.S., Ph.D. Mich. 26.	Cambridge Adrian.	Physiology.
Arda A. Green, A.B.; M.D. J. Hopkins 1927.	Not determined.	Biochemistry.
Haldan K. Hartline, B.S.; M.D. J. Hopkins 1927.	Johns Hopkins Pfund and Wood.	Physiology.
Thomas D. Jones, A.B.; M.D. Va. '23.	Univ. College, London; Lewis.	Internal Medicine.
John F. Kessel, A.B.; M.A.; Ph.D. Calif. '23.	Johns Hopkins Cort and Hegner.	Parasitology.
Robert M. Moore, M.D. Wash. U. '26.	Harvard Cannon.	Physiology.
Paul W. O. Preisler, B.S., M.S., Ph.D. Wash. U. '27.	U. S. Hygienic Lab. Clark.	Biochemistry.

Name	Location	Subject
Francis O. Schmitt, A.B., Ph.D. Wash. U. '27.	U. of Calif. Lewis.	Physiology.
Vincent duVigneaud, B.S., Ph.D. Rochester '27.	Johns Hopkins Abel.	Biochemistry.
Lester R. Whitaker, M.D. Harvard '23.	Harvard Cushing.	Surgery.

The fellows in medicine were reappointed:

Name	Location	Subject
Leopold R. Cerecedo, Ph.D. Munich '21.	Yale Mendel.	Biochemistry.
Martin H. Dawson, M.D. McGill '23.	Rockefeller Inst. Cole.	Pathology.
Peter Heinbecker, M.D. McGill '21.	Washington Univ. Erlanger.	Physiology.
Francis F. Heyroth, M.D. Cincinnati '25.	Univ. of Upsala. Svedberg.	Biochemistry.
Ralph G. Smith, M.B. Toronto '25.	Univ. of Chicago. Tatum.	Pharmacology.
Willard O. Thompson, M.D. Harvard '23.	Harvard. Henderson.	Biochemistry.

The fellowships now offered by the Medical Fellowship Board are intended primarily for training in research. Applications to be considered at the September meeting should be filed on or before August 1.

SCIENTIFIC NOTES AND NEWS

DR. W. S. THAYER, emeritus professor of medicine in the Johns Hopkins University, was elected president of the American Medical Association at the recent Washington meeting.

DR. W. F. G. SWANN, professor of physics and director of the Sloane laboratory at Yale University, has been appointed director of the Bartol Research Foundation of the Franklin Institute, Philadelphia.

MEMBERS of the United States Geological Survey on May 2 tendered Dr. George Otis Smith a testimonial luncheon in honor of his completion of twenty years as director. Dr. Smith became a member of the survey in 1896 and was appointed director in 1907.

DR. C. C. SPEIDEL, associate professor of anatomy at the University of Virginia, was awarded the first research prize of $50 given by the Virginia Academy of Science for meritorious original research presented at the fifth annual meeting held at Blacksburg, on May 6 and 7. The prize-winning paper was entitled "Regenerative Phenomena under Conditions of Hyperthyroidism."

PROFESSOR OTTO WARBURG, director of the department of biology of the Kaiser Wilhelm Institute of Berlin, has been made a foreign member of the Danish Society of Sciences.

PROFESSOR L. PRANDTL, of Göttingen, has been awarded the gold medal of the Royal Aeronautical Society. The presentation was made on May 16, The medal was awarded to the Wright brothers in 1909, Professor Chanute, 1910, E. T. Busk and Professor G. Bryan, 1915, and to Professor Manchester, 1926.

DR. WARO NAKAHARA, of the Government Institute for Infectious Diseases, Tokyo, formerly of the Rockefeller Institute, New York, was awarded the prize of the Japan Cancer Society, at the recent annual convention of the society, in recognition of his work on chicken sarcoma.

DR. R. J. TILLYARD, chief of the biological department, Cawthron Institute, Nelson, New Zealand, has been elected an honorary member of the Entomological Society of Belgium.

DR. HERBERT FREUNDLICH, professor of physiological chemistry at the University of Berlin, has been appointed director of the Kaiser Wilhelm Institute of physical chemistry and electro-chemistry at Berlin-Dahlem.

PROFESSOR T. A. JAGGAR, of the Hawaiian Volcanic Observatory, has arrived in Alaska, where a scientific study of volcanic eruptions and earthquakes is being carried out by the U. S. Weather Bureau. Professor Jaggar will superintend the installation of seismographs at Dutch Harbor and at Kodiak.

DR. HUGH M. SMITH, who has been establishing a Bureau of Fisheries for the Siamese government for the past several years, is in Washington on vacation for the summer.

FREDERICK G. KRAUSS, professor of agronomy and genetics at the University of Hawaii, leaves Honolulu on May 30 for an extended study of tropical crop plants, especially of the pineapple, in the Dutch East Indies and Malaya, and of Cajanus in the Himalayan region beyond Pusa. He expects to reach Berlin in time to attend the Fifth International Genetic Congress on September 11, after which he will devote a year to genetic study in Germany.

DR. KARL JORDAN, entomologist of the Rothschild Museum at Tring, England, is spending several weeks at the U. S. National Museum studying the types of fleas.

AT the University of Chicago, leaves of absence have been granted to Professor A. C. Noe, of the department of botany, who is a member of a commission

appointed by the Soviet government to study the coal fields of the Donetz basin, and to D. S. Whittlesey, associate professor of geography, for three quarters in 1927 and 1928 to permit him to become a member of the round-the-world cruise to be conducted by New York University.

DR. E. L. THORNDIKE, professor of education in Teachers College, Columbia University, has been granted a leave of absence for the second half of the next academic year. Professor Leta S. Hollingsworth will be on leave for the entire year.

DR. ROBERT DEC. WARD, exchange professor from Harvard University, began a series of lectures on climatology at Knox College on April 13.

DR. SIMON FLEXNER, director of the Rockefeller Institute, has been named to the lectureship of the Association of American Physicians.

DR. ARTHUR W. BROWNE, professor of chemistry at Cornell University, and Professor James F. Norris, professor of organic chemistry at the Massachusetts Institute of Technology, were the principal speakers at the dedication of the new laboratory of chemistry at Wesleyan University on May 13 and 14.

DR. A. S. WARTHIN, professor of pathology in the University of Michigan, has been elected president of the American Association for Cancer Research.

PROFESSOR CHRISTIAN C. RUCKMICK, of the department of philosophy and psychology at the State University of Iowa, has been elected president of the Iowa chapter of the Sigma Xi for the coming year.

DR. WILLARD ROUSE JILLSON, director and state geologist, Kentucky Geological Survey, will deliver a series of nine lectures on the "Geology and Geography of Kentucky" during the coming months of June and July before advanced classes at Morehead State Normal School and Teachers College, Kentucky.

DR. DAYTON C. MILLER, head of the physics department, Case School of Applied Science, delivered two lectures on May 4 and 5 at Pittsburgh under the auspices of the department of physics of the University of Pittsburgh and of the Westinghouse Electric and Manufacturing Company. The titles were "Ether Drift and the Theory of Relativity" and "Photographing and Analyzing Sound Waves."

DR. W. J. HUMPHREYS, meteorological physicist, of the U. S. Weather Bureau and general secretary of the American Association for the Advancement of Science, addressed the Johns Hopkins chapter of the society of the Sigma Xi on the evening of May 19, his subject being "Some Facts and Fancies of Weather Lore."

DR. OSCAR RIDDLE, of the Carnegie Institution, delivered Sigma Xi addresses at the University of Cincinnati on May 4, and at the University of Kentucky on May 6, on "Metabolism and the Newer Aspect of the Sex Problem." To the faculty and students of the medical college at Cincinnati on May 5 he gave an address entitled, "On Endocrines and Organisms." He also addressed the Kentucky Academy of Sciences on May 7 on "The Thyroid Gland in Economics, Agriculture and Medicine."

DR. CHRISTINE LADD FRANKLIN gave a lecture at the Harvard Medical School on May 24 on the subject "Evidence that the Nerve when stimulated emits Physical Light."

DR. RICHARD HAMER, of the University of Pittsburgh, spoke on "The Significance of Cosmic Radiations from Outer Space," before the Pennsylvania Academy of Science at the recent annual meeting held at Harrisburg, Pa. A paper on "Soft X-Rays and Critical Potentials" was presented to the members of the Pittsburgh Physical Society by Professor Hamer at their last monthly meeting.

PROFESSOR W. J. CROZIER, of the department of zoology at Harvard University, delivered a lecture on tropisms to the biology seminar at Clark University on May 11.

DR. S. B. BUCKMASTER, formerly professor of physiology in the College of Physicians and Surgeons, Chicago, died on April 16, aged seventy-three years.

DR. FRANZ MERTENS, emeritus professor of mathematics at the University of Vienna, has died at the age of eighty-seven years.

DR. ALBERT GOCKEL, professor of physics at the University of Freiburg, died recently at the age of sixty-six years.

DR. ABERCROMBIA ANSTRUTHER LAWSON, F.R.S., professor of botany in the University of Sydney, died on March 26, aged fifty-three years.

MEMBERS of the University of Michigan's Greenland expedition have sailed from New York for Copenhagen. Professor W. H. Hobbs is director, glacialist and meteorologist; S. P. Fergusson, adviser on meteorological equipment; J. E. Church, meteorologist; R. L. Belknap, geodesist and geologist; C. O. Erlanson, botanist; C. R. Kallquist, aerologist; Fred Herz, photographer and expert mechanic, and P. C. Oscanyan, wireless expert. They will sail from Copenhagen on May 28. Dr. Church and Mr. Oscanyan expect to remain in Greenland and occupy a weather station at a high level throughout the winter. Mr. Erlanson is

to spend the winter at the Disco Arctic Station. The others return in the fall.

THE seventh annual convention of the New England Geographical Association was opened on May 20 at Clark University with an address of welcome by President Wallace W. Atwood. The speaker of the morning was Dr. Ridgely, a member of the department of geography and a member of the faculty of the recently returned floating university. His subject was "The First University World Cruise." In the afternoon Dr. Huntington, of Yale University, led a symposium on China, at which Dr. Van Valkenberg, of Clark University; Dr. George Baker, of the United States Department of Agriculture; Dr. Blakeslee, head of the department of history and international relations at Clark University, and George C. Randall, of the American Railway Association, were contributors. At night Dr. Atwood gave an illustrated lecture on "The Orient." "Field Methods in High-school Geography" was the topic of a round-table conference on May 21. A dinner in the Easterbrook Hall dining-room, with the visitors as the guests of the university, closed the convention.

ON Friday and Saturday, May 13 and 14, a group of midwestern experimental psychologists met on the downtown (Chicago) campus of Northwestern University. This was the second annual meeting of the association. There were addresses by Dean George F. Arps and Professor Harvey A. Carr. A number of formal papers were presented on Saturday morning, and in the four-hour afternoon session laboratory reports of current research were called for from the institutions represented. At this meeting steps were taken to organize the group into the Midwestern Psychological Association, of which Professor A. R. Gilliland, of Northwestern University, was elected president for the coming year. The affairs of the organization are in the hands of an executive council composed of Drs. Hull, Metfessel, Renshaw and Thurstone. Over two hundred psychologists and guests were in attendance. The next meeting will be held about this time next year at the University of Wisconsin. There was a banquet in the evening at which President Walter Dill Scott acted as toastmaster.

THE following public lectures are being given this spring at the Brooklyn Botanic Garden: May 15, "The Importance of the Soil for Plant Growth," Dr. B. A. Keen, vice-director, Rothamsted Experimental Station, England; May 22, "Rock Garden," Montague Free, horticulturist, Brooklyn Botanic Garden; May 29, "Irises and their Cultivation," Dr. G. M. Reed, curator of plant pathology, Brooklyn Botanic Garden; June 5, "Ornamental Trees and Shrubs for the Home Grounds," Dr. Arthur Harmount Graves, curator of public instruction, Brooklyn Botanic Garden.

THE nineteenth meeting of the Australasian Association for the Advancement of Science will be held in Hobart, Tasmania, during the week commencing January 16, 1928. The president-elect is Mr. R. H. Cambage. According to *Nature* the following presidents of sections have been elected; Section B (chemistry), Professor H. G. Denham, Canterbury College, Christchurch, N. Z.; section C (geology and geography), Professor L. A. Cotton, University of Sydney; section D (zoology), Dr. Colin Mackenzie, director of the National Museum of Australian Zoology, Melbourne; section E (history), Mr. T. Dunbabin; section F (anthropology), Dr. R. H. Pulleine; section G (social and economic science and statistics), Professor R. C. Mills, University of Sydney; section H (engineering and architecture), Mr. Alan C. Walker; section I (medical science and national health), Dr. J. H. L. Cumpston; section J (education, psychology and philosophy), Mr. M. P. Hansen; section K (agriculture and forestry), Professor A. J. Perkins, director of agriculture, South Australia; section L (veterinary science), Mr. Max Henry; section M (botany), Professor T. G. B. Osborn, University of Adelaide; section N (physiology and experimental biology), Professor H. G. Chapman, University of Sydney; section O (pharmaceutical science), Mr. Edward Mayhew. The honorary general secretary of the Australasian Association is Dr. A. B. Walkom, Royal Society's House, 5 Elizabeth Street, Sydney, and the honorary secretary for the Hobart meeting, Mr. Clive Lord, director of the Tasmanian Museum, Hobart.

ACCORDING to a notice issued by Professor F. J. M. Stratton, general secretary, the next meeting of the International Astronomical Union will be held at Leiden, Holland, beginning July 5, 1928.

THE Institution of Fuel Technology and the Institute of Fuel Economy Engineers have been merged into one body, and in future will be known as the Institute of Fuel. Sir Alfred Mond was president of both institutions, and presided at the meeting of the new body on April 28, in London.

UNDER the will of the late Professor A. W. Scott, Phillips professor of science at St. David's College, Lampeter, the University of Cambridge is to receive £7,000 and the Royal Society £1,000, the income from which is to be applied for the promotion of the physical sciences.

THE sum of $100,000 has been added to the original gift of $1,000,000 given by the Carnegie Corporation

to Columbia University. These sums will be used in erecting and equipping the new medical center. Thirty-three other gifts, including $124,286 in cash, have been announced by trustees of the university. The sum of $2,500 has been contributed by the Copper and Brass Research Association. The department of bacteriology receives an added gift of $1,250 from Willis D. Wood and Dr. Seely G. Mudd has given $1,000 for work in the Institution of Cancer Research. James Taylor Kemp gave to the department of geology and mineralogy the scientific library of his father, the late Professor James Furman Kemp.

A CORRESPONDENT writes that the regents of the University of Minnesota have approved the recommendation that the name of the department of animal biology be changed to that of the department of zoology. In the early days of the university the work in zoology and in botany was under the supervision of the professor of geology. In the catalogue for the year 1884–85 there is the first indication of the independent place of zoology, but in 1885 Professor Henry F. Nachtrieb was appointed assistant professor of biology and in 1889 his title was that of professor of animal biology. As the work of the department is that covered elsewhere by the department of zoology, the change in name appeared to the regents as desirable. The university is expanding the work in zoology in the summer session so as to provide opportunity for teachers and others who can not attend the regular session. Professor H. W. Norris, of Grinnell College, will give the course in general zoology and an advanced course in comparative anatomy in the coming summer session of the University of Minnesota. Professor E. W. Stafford, of Mississippi A. and M. College, will offer the summer work in elementary and advanced entomology.

THE Alberta Government has made a grant of $2,500 to the Metallurgical Congress of the British Empire. This congress is to make a tour of Canada during the coming summer and their western itinerary will include stop-overs of varying periods in Edmonton, Jasper Park, Coal Branch, Sturco, Lethbridge, Turner Valley, Banff and Crowsnest Passes. The first session of the congress will be held in eastern Canada on August 22.

ACCORDING to press dispatches from Oslo ten expeditions of foreign astronomers have announced that they will go to Norway to study the total eclipse of the sun which occurs on June 29. The absolute solar obscuration will be visible in Alaska, Europe, Asia and north Africa. From the United States Professor Samuel A. Mitchell, astronomer of the McCormick observatory of the University of Virginia, is to lead an expedition which will establish its headquarters at Fagernas, in the Valdres Valley.

IT is announced that the University of Michigan, which sent an expedition to Greenland last year under Dr. William H. Hobbs, professor of geology, will send a group again next summer to continue the research work. Two members of the party will establish themselves in a hut, erect a wireless apparatus and remain in Greenland through the following winter.

STANFORD UNIVERSITY has dropped its proposed $1,000,000 Luther Burbank foundation fund to perpetuate the experimental work at Santa Rosa and Sebastopol.

A FUND of $50,000 for dental research at Temple University, at Philadelphia, has become available through the death of Dr. Henry Isaiah Dorr, emeritus professor of anesthesia in the school of dentistry there. The income of the fund will be used to establish, equip and maintain a laboratory of dental pathology and bacteriology, with special reference to the relationship existing between these subjects and anesthesia.

THE Japanese Department of Commerce and Industry has appropriated the sum of 111,000 yen for research and experimental production in connection with the working of the deposits of iron sands in northern Japan. A total of 200,000 yen per year for at least the next three years will be granted for this purpose.

NEARLY 60,000 range plants, representing more than 6,000 different species, have been collected by the Forest Service in the last 20 years, thereby making the Forest Service herbarium, in Washington, the most complete specimen of its kind in the United States. The collecting of the plants represents the work of more than 1,000 collectors. Each plant is accompanied by a note stating its forage value, growth requirements and other important data.

UNIVERSITY AND EDUCATIONAL NOTES

THE campaign for $6,000,000 to complete the medical center at Western Reserve University has been opened with $2,000,000 already subscribed.

NEGOTIATIONS are under way for a new site for the Polytechnic Institute of Brooklyn. The board of estimate of the City of New York has sanctioned the sale by the city to the Polytechnic Institute of the block bounded by Third and Fourth Streets and Fourth and Fifth Avenues. An enabling act has been passed by

the legislature and signed by the governor authorizing the sale. Negotiations are under way for the purchase of additional property so as to make a plot of approximately eight acres.

AT the University of Chicago, Dr. Fielding Wilkinson, of the Mayo Foundation, has been appointed assistant professor of otolaryngology, and Dr. Bela Halpert, of the Johns Hopkins University, assistant professor of pathology. Associate Professor Edward Sapir and Associate Professor Fay-Cooper Cole, of the department of sociology and anthropology, have been made full professors. Assistant Professor Maud Slye, of the department of pathology, has been made an associate professor.

THE trustees of Williams College have made the following appointments for the next college year: Dr. Wilford E. Kaufman, assistant professor of chemistry, to take the place of Professor John F. King, who will be absent on sabbatical leave; Donald E. Richmond, assistant professor, will replace Dr. Malcolm Foster, resigned, in the mathematics department, and Edward H. Cutler, instructor, will fill the vacancy made by the absence on leave of Professor Hardy, of the same department.

DR. C. S. HAMILTON, associate professor of chemistry at the University of Nebraska, has accepted a similar position at Northwestern University. He will have charge of the researches on organic compounds of arsenic.

G. H. ESTABROOK, of Springfield College, Massachusetts, has been appointed assistant professor in psychology at Colgate University.

DR. CYRIL A. NELSON, associate in mathematics at the Johns Hopkins University, will go to Rutgers University next year.

DR. ARNOLD SOMMERFELD, professor of theoretical physics at the University of Munich, has been called to the chair of theoretical physics at the University of Berlin, left vacant by the retirement of Professor Max Planck.

DR. HANS FISCHER, professor of organic chemistry at the Institute of Technology in Munich, has been called to the chair of organic chemistry at the University of Leipzig, to take the place of Professor Hantzsch, who recently retired.

DISCUSSION AND CORRESPONDENCE

THE ARCTIC FLYING OF CAPTAIN WILKINS AND LIEUTENANT EIELSON

WE want to call attention to one of the most heroic and dramatic adventures of polar history, which is now going on in the Arctic north of Alaska, where Captain George H. Wilkins, Lieutenant Ben Eielson and their associates have already made striking contributions to science and the progress of northern aviation, although their program is only in its beginning.

Last year the city of Detroit, ambitious to become the air capital of the world as it is already the motor capital, got behind the plans of Captain Wilkins and sent out an expedition which on its scientific side was sponsored by the American Geographical Society of New York. They had much bad luck. Two planes were seriously disabled by unfortunate landings and one in an unsuccessful attempt to take off with a heavy load. But the thing to remember about these accidents is that they all took place on a regular landing field in the city of Fairbanks, Alaska, which is in the temperate zone and not in the Arctic. In the Arctic itself the Wilkins expedition of last year had only one accident in 5,000 miles of flying; this was when Wilkins broke his wrist in taking off from a prepared landing place at Barrow.

The Wilkins expedition of last year had no accident in the air or in landing. They crossed five times a range of Arctic mountains so little known that it had been given on maps as 5,000 or 6,000 feet high, while it proved to be around 10,000. One of these flights was from Fairbanks, 550 miles north to Barrow and thence 150 miles out over the ocean and then back to Barrow, a flight on which 10,000 square miles of previously unknown territory were seen. Thus Wilkins proved that flying is distinctly feasible in the most northerly possession of the United States, setting at rest a controversy of importance both in civil and military aviation as to whether Alaska can be used as a flying base for commercial or military operations against Asia, and as to whether Alaska could be flown across by Asiatic airplanes wishing to reach Canada or the United States by that route for purposes either of peace or war.

This year the plans of Captain Wilkins were quietly resumed with the support of the Detroit *News*. He took two Stinson planes to Fairbanks, and he had one Fokker there already. The only accident this year was to one of the skis of the largest machine, which broke under a heavy load when they were trying to take off from the Fairbanks landing field. Thereupon with two of his own planes and one hired at Fairbanks, Wilkins took again the 550-mile flight across the Endicott range and the northern prairies to Point Barrow, once more without accident or any trouble.

Then on March 29, with fuel for 1,400 miles in calm weather, Wilkins and Eielson took off in a Stinson plane, intending, if all went well, to fly 600 miles northwest, then 200 miles south, and thus back to Bar-

row, more than half this distance over territory never seen by human beings, thus making a great inroad into the largest unexplored area north of the equator. They had flown 550 miles and had almost completed the outward flight when engine trouble developed and they had to make a forced landing.

This was a deciding moment in Arctic aviation, for there have been two theories as to the safety of landing on the frozen sea. One school has held that there are scarcely any safe landing places on the moving Arctic pack, and the other school, to which Wilkins himself belonged, that landings are so numerous that there seldom is a five-mile stretch without a fairly good one. (Byrd has not agreed with Wilkins but has taken a position between the two theories—nearer to the first.)

In less than five miles they did find a place that looked good to Wilkins. He gave the instructions and Eielson made a perfect landing on ice which turned out to be about three and a half feet thick when Wilkins, a few minutes later, made the holes in it which were necessary to take a sonic sounding. He took two soundings and found the ocean there to be about three miles deep, which makes it very unlikely that any land can exist in this direction, for their flight, if continued far enough in the same direction, would have taken them near where Nansen years ago in the *Fram* took similar soundings. This sounding was a verdict as decisive in oceanography as the landing had been in aviation. It made it extremely probable that those are wrong who, following Harris, have maintained that there is a great unknown land in the Arctic, and that those are right who, following Nansen, have argued that it is in the main a deep sea.

While Wilkins was doing this sounding, Eielson tinkered with the engine. In two hours they were in the air again, flying back towards land because a strong offshore wind had blown up, making it probable that the gasoline would fail to take them ashore even now.

After about 10 minutes' flight, the engine gave trouble once more. There was a second forced landing and a second test of the question of landing places. Again Wilkins picked out a likely site, and again Eielson made a perfect landing. This time both worked on the engine and made a better job, so that when they took off a second time the machine hummed along smoothly. But clouds gathered and the wind stiffened continually, so that they presently realized that they were unlikely to get ashore. It was after sundown, with heavy clouds in a thick blizzard, when the engine stopped suddenly, out of gas. This time they could not see anything and the landing was pure luck. As a matter of fact, instead of striking a very smooth expanse, as might have happened by chance, they struck a very rough one, and it was as if by a miracle that they made a landing safe for themselves, although it crippled their plane. But that crippling was of no practical consequence when they were out of gas anyway.

It now developed that Eielson had frozen his fingers severely when tinkering barehanded with metal tools on the metal of the engine at 30° below zero in a strong wind. Wilkins asked him later why he had not taken time off to warm his hands occasionally and keep them from freezing, to which Eielson replied that he "preferred losing a few fingers to losing both arms and legs and what they were fastened to."

Wilkins and Eielson spent five days on the floe where they landed and during that time another strange thing happened, for the ice in this quarter is usually drifting west and Wilkins noted in his diary that they would therefore probably have to land in Wrangel Island, but instead it now drifted rapidly east, and when they had broken up the wooden parts of the plane and made them into sledges, they found themselves 100 miles east of Barrow instead of several hundred miles west (as might easily have been the case had the drift been as usual) and 70 miles from shore, or 30 miles nearer than when they had been forced down.

Wilkins reports laconically about the journey ashore that they slept comfortably at night in the snowhouses which they built, that they saw plenty of game and could have secured seals for food and fuel indefinitely had they needed it, but that they had with them enough biscuits and chocolate to eat and enough engine oil to burn. They were hurrying for two chief reasons—because Eielson's hand had been so severely frozen that an amputation of fingers seemed necessary, and because they wanted to get back to Barrow so they could do more flying with their other planes before the summer fogs commenced. This hurry made them take possibly unnecessary chances on thin ice, and in consequence Wilkins fell through on one occasion, getting wet to the armpits at a temperature of 30° below zero (62° Fahrenheit below freezing). His only comment is that he knew his other garments would dry better on his body than otherwise and that he had no change of clothing anyway, but that he did have a change of socks and boots which he made promptly in the lee of an ice ridge.

After several days' travel the ice became so rough that the improvised sledge could not be pulled over it. Wilkins recognized that this was the shore ice and that it was therefore safe to leave the sledge behind. So they took the more important baggage as packs on their backs and scrambled over ridges of slippery ice where the crevices between the broken pieces were filled with snow so soft that they had to crawl several

miles—in the sense that they would keep their hands on pieces ahead while their knees and feet were on the pieces they were just leaving.

Their astronomical observations proved to have been correct and their course took them directly into the Eskimo settlement at Beechy Point, where there is a trading station. From here they made their way to Barrow, where Eielson's little finger was amputated at the mission hospital. The other fingers were saved.

His deep soundings having made it improbable that there is undiscovered land in the 600,000-mile section to the northwest of Barrow, Wilkins now plans to cross the 300,000-mile section to the northeast, where there is the best remaining chance of land. He expects to fly diagonally through the middle of it from Barrow to 84° N. Lat. and 100° W. Long. and thence to Ellesmere Island, coming down when they have to or possibly flying nearly, if not quite, all the way to Etah.

If the plane comes down anywhere on this route, Wilkins expects his party to live by hunting seals and make their way to the nearest inhabited land. This will be Alaska if they have hard luck and come down soon. It may be any of the Canadian islands, according to how far they succeed in flying; it will be Etah, northwest Greenland, if everything goes like clockwork. The outcome of the adventure can not be known before perhaps midsummer when the Danish trading ships go up to Etah or the Canadian government ships go to Ellesmere Island. If nothing is heard then or before that time, it will mean either a fatal landing or a successful landing at a distance from which the party are returning, building snow-houses in winter, using skin tents in summer and living on sea game. Wilkins estimates the maximum time necessary for such a return on foot will be two years. We wish him luck with his great adventure.

RICHARD E. BYRD,
VILHJALMUR STEFANSSON

EFFECT OF HIGH VOLTAGES ON TANTALUM ANODES

DURING some recent work with high voltages upon metal electrodes I have found that tantalum exhibits some very unusual phenomena when used as a positive electrode in certain electrolytes. Very brilliantly colored films are formed on the metal in the following order: violet, reddish purple, indigo, light blue, green gold, light yellow and finally gray. The colors were produced in succession by increasing the voltage so that any one of the above colors may be obtained by shutting off the current at the proper time. The films form just before the electrode begins to emit light and the highly colored ones disappear when tiny scintillating sparks appear on the surface of the film. The gray film mentioned above is the final product after the breakdown voltage is exceeded. The films are apparently permanent and the colors give no evidence of being formed by interference. I have been unable to reproduce them by heating or other means and am withholding any possible explanation of the phenomena until further data are available.

EARL M. DUNHAM

UNIVERSITY OF MAINE
PHYSICAL LABORATORIES

LOSSES IN SPECKLED TROUT FRY AFTER DISTRIBUTION

THE Fisheries Department of Ottawa has recently received from the Biological Board of Canada a memorandum of the losses in four thousand speckled trout fry after distribution in Forbes brook, Prince Edward Island, Canada, for three months (July–October) of 1926. Mr. H. C. White, B.A., was investigator for the Board for 1926 as well as for the three previous summers. The supervising investigator was Dr. A. G. Huntsman.

The plan selected for the experiments provided that a part of the upper stretch of the brook should be subdivided into four equal sections of ten rods each. Each section was separated from the other by transverse wire screens which were fry tight. Each section was seined completely free from enemy and competition fish before an experiment began, except as mentioned below.

The object of three of the experiments was to ascertain whether (1) adult trout (any over one year old) or (2) birds, or (3) stickleback caused the greatest loss among fry after distribution. (4) The object in the fourth experiment was to determine the total loss from all natural causes combined.

Section No. 1 was left in its natural condition and planted with 1,000 fry. At the end of three months, 712 of them were missing. This compares with seventy-three per cent., which was the loss in 1925 near the same place. Of 38 adult trout in this section in the spring, only 19 survived until October.

Section No. 2. The adult trout were removed and it was screened overhead from birds. 209 stickleback were confined with 1,000 fry. Out of the 1,000 fry deposited in it, only 504 survived at the end of three months.

Section No. 3. Birds were screened from this section and all fish seined except 32 adult trout. Here only 361 fry survived out of 1,000.

Section No. 4. Stickleback and adult trout were removed from this section; but it was left exposed to birds. Out of 1,000 fry planted in the spring, only 435 were found alive in autumn.

From the foregoing experiments it would appear that stickleback alone caused the death directly or indirectly of 49 per cent. of the fry; birds, 57 per cent.; adult trout 64 per cent.; and all natural enemies combined 71 per cent.

Summarizing our results for the past four summers: In 1923, the loss of trout fry in southwestern Ontario was 96½ per cent.; in 1924 it was 98 per cent., same place; in 1925, it was 73 per cent.; and in 1926 it was 71 per cent. These two latter on Forbes brook, Prince Edward Island, Canada.

It is quite possible that a portion of the losses may be due to cannibalism among the fry themselves; but this would not alter the total losses as given above.

A. P. KNIGHT

KINGSTON, ONTARIO,
CANADA

THE NEED FOR DEFINITELY INDICATING NEW SYNONYMY AND NEW COMBINATIONS IN TAXONOMY

RECENTLY Dr. Schramm, of *Biological Abstracts*, requested me to serve as a member of a committee to advise the organization publishing *Biological Abstracts* in regard to a number of policies on indexing information from taxonomic papers. One of these questions dealt with the indexing of synonymy and another with the indexing of new combinations of generic and specific names.

It is very important that the working taxonomist should know when a given species is transferred from one genus to another, and it is equally important that he should know when a species name has been suppressed as a synonym of some previously described species. It is the aim of the founders of *Biological Abstracts* to furnish such essential information to students of taxonomy. They have found it very difficult to tell from many papers whether synonymy as indicated in the paper is new or has been previously recorded. They have also found it difficult to determine when species are transferred for the first time from one genus to another. This is especially true for papers dealing with taxonomic zoology.

It therefore seems advisable to present for the discussion of taxonomic zoologists the desirability of determining some way of indicating in their papers when new synonymy is proposed and when new combinations of generic and specific names are employed. In many of the recent extensive revisionary papers, long specific bibliographies have been given with no indications as to whether any of the synonymy is new. It is suggested that an easy way to overcome this would be to write in parentheses the words "new synonymy," or some abbreviation thereof, after each reference to a newly published synonym.

The labeling of new combinations or transfers of species from one genus to another forms a more decided digression from the practice commonly used by zoologists, and especially entomologists; but it is believed that if taxonomic workers would place the words "new combination," or some abbreviation thereof, in parentheses after each such transfer or new combination, it would greatly expedite the work of abstractors and catalogers, and to no small degree assist their colleagues.

Botanists have been much more careful and definite in indicating and cataloging all new combinations. I think it is time for the zoologists to take a lesson from the botanists and label their new combinations. It seems to me equally important that the botanists and zoologists agree to indicate in some clear manner all new synonymy.

S. A. ROHWER

BUREAU OF ENTOMOLOGY,
WASHINGTON, D. C.

SURFACE TENSION METHODS

ATTENTION should be called to the misapplication of a quotation of Lenard in SCIENCE for March 18, 1927. Lenard states that the straight wire method, as a tearing off method, "as opposed to the ring method" (in Gegensatz zur Ring- oder gar Scheibform des Abreisskörpers) gives the accurate results to which Dr. du Noüy refers. Lenard by no means considers the ring method on equal terms with his own "tearing off method." Lenard's method is not entirely recent and was approved as a substitute for the ring method several years ago. (*Cf. Jour. Phys. Chem.* 1925, 897.)

J. M. JOHLIN

VANDERBILT MEDICAL SCHOOL,
NASHVILLE, TENNESSEE

SCIENTIFIC BOOKS

The Fauna of British India, including Ceylon and Burma. Hirudinea. By W. A. HARDING and J. PERCY MOORE. London: Taylor and Francis, March, 1927.

THE new volume of the fauna of British India, devoted to leeches, is perhaps the most exhaustive and certainly one of the most interesting of the whole series. As there are only forty-six species to be discussed, it is possible in about three hundred pages to go into a great deal of detail about structure, habitat and relationship to human affairs. The editor, Sir Arthur E. Shipley, contributes a readable historical

preface, in which he relates the various opinions of ancient times concerning leeches. Professor J. Percy Moore has written a chapter on segmentation of the Hirudinea, and has worked up the families Erpobdellidae and Hirudidae, including the familiar large leeches of the type used in medicine, and the dreaded blood-sucking land leeches. Mr. W. A. Harding describes the Ichthyobdellidae and Glossiphonidae, which include just half of the species in the fauna. Among the Glossiphonidae are *Glossiphonia complanata* and *Helobdella stagnalis*, also found in North America. Most remarkable is the account of the ferocious land leeches of the genus *Haemadipsa*. Although these have been discussed by many writers, there is much still to be learned concerning them. In their local variations, with the formation of distinctive subspecies or closely related species, they are said to differ from the aquatic leeches, and follow more nearly the manner of evolution of the land snails. Moreover, several of the color-varieties are associated with land planarians which are similarly colored, suggesting mimicry. Altogether, the book is much more than a local fauna, and will rank as a standard work, indispensable to all who have occasion to study leeches.

T. D. A. COCKERELL

UNIVERSITY OF COLORADO

Vorgeschichtliches Jahrbuch für die Gesellschaft für vorgeschichtliche Forschung. Herausgegeben von MAX EBERT. Band II: Bibliographie des Jahres 1925 mit sechs Tafeln und einer Abbildung im Text. Berlin und Leipzig. Walter de Gruyter und Co., 1926.

THE Gesellschaft für vorgeschichtliche Forschung, founded in 1925, has for its object the advancement of Prehistory in all its fields. Its managing committee consists of Max Ebert (chairman), Königsberg; O. Almgren, Upsala; G. Karo, Halle; B. Meissner, Berlin; H. Obermaier, Madrid; H. Ranke, Heidelberg.

The 344 pages of the Prehistoric Year Book form a fair criterion of the ever-increasing activity in the general field of prehistory. All but seventy-eight pages are given over to bibliography, only the more important references being accompanied by a review consisting of one or at the most a few paragraphs. This "review" of the literature comes under four heads: A, Europe—General; B, Paleolithic and Mesolithic; C, Europe—Neolithic and later periods; D, Egypt; E, Palestine and Syria; F, the Near East.

The other features of the volume are: (1) an illustrated article on the excavation of prehistoric fortifications (twenty-two pages), (2) news of a scientific and personal nature, and (3) the index, consisting of twenty-eight pages. This is an Old World Year Book, as will be seen from the table of contents. That such a large and creditable volume is annually possible is a striking commentary on the rapidity with which our knowledge of Old World prehistory is expanding; it fully justifies the existence of our American School of Prehistoric Research, founded in 1921 in order that American students might the more readily obtain first-hand knowledge of Old World prehistoric records as well as to have a part in recovering and interpreting them.

GEORGE GRANT MACCURDY

YALE UNIVERSITY

SPECIAL ARTICLES

THE DECOMPOSITION OF AMMONIA ON IRON CATALYSTS

THE catalytic activity of a number of promoted iron catalysts used in the synthesis of NH_3 from N_2 and H_2 was investigated by the decomposition of NH_3 on specially prepared surfaces.[1]

The NH_3 catalyst consists of a fused mixture of pure artificial magnetite to which about 1 per cent. of aluminum oxide and 1 per cent. of an alkali oxide, usually potassium, has been added in the fusion process. The mixtures investigated included an unpromoted iron, an iron promoted with aluminum and potassium oxides, and a tin poisoned catalyst.

The surface upon which the decomposition took place was prepared by fusing the mixture of the finely powdered granules to a twisted platinum strip.[2] It was found that the coating process could be carried on through a range in temperature of from about 300° C. to 1,200° C. Very uniform coatings of the desired thickness of the mixture can be obtained so that the temperature of the coating was very uniform and easily controlled by varying the current through the strip. The chemical activity of these surfaces after a thorough reduction depended upon whether the catalyst mixture was coated in the reduced or metallic form, or in the unreduced or oxide form, and the temperature at which the coating takes place. Thus the rate of decomposition of NH_3 on a given catalyst mixture at a given temperature was found to vary four fold. The coated strip was mounted in a two liter decomposition chamber, and the increase in pressure with time, for a given temperature, was re-

[1] Preliminary results on the use of this method for the testings of catalysts was presented at the Jubilee Meetings of the American Chemical Society at Philadelphia in September, 1926.

[2] *Jour. Phys. Chem.*, 30, 525, 1926; *Jour.* Franklin Institute, May, 1927.

corded. By making the hot strip an arm of a wheatstone bridge arrangement, the temperature of the hot surface could be kept very constant through the decomposition test. The temperature setting was made from a calibration curve obtained from the resistance of the bridge settings and temperature of the surfaces, as determined by an optical pyrometer.

From the time for one half of the NH_3 to decompose on the surface for various temperatures the value of E in Arrhenius equation—rate of chemical change = $Ae^{-\frac{E}{RT}}$ was determined. E is the observed heat of activation determined from the slope of the straight line for which the abscissa is the reciprocal of the absolute temperature and the ordinate is the logarithm of the time for one half of the NH_3 to decompose. The resulting value of E has been determined from a 200 degree change in temperature, for temperatures between 475° to 750° C. depending upon the activity of the catalyst. From the nature of the reaction, and relatively small effects of the products of the reaction on the initial rate of decomposition, E may not be far from the true heat of activation or the measure of the molecular stability on the surface.

The results of these tests give values of E for the various catalysts from 38,000 to 42,000 calories per gram molecule, where the difference in catalytic activity of the various mixtures for a given temperature was as much as eighteen fold, as measured by the rate of the decomposition of NH_3.

It would seem, then, that the effect of a promoter or poison on the catalysis is to increase or decrease respectively the active surface or parts of the surface where decomposition takes place.

These results on the effect of a promoter or poison are in agreement with the idea of an extension of the active surface arrived at from experiments on the synthesis of NH_3.

The more active catalysts for the decomposition were also the best catalysts for the synthesis; likewise the poor or poisoned catalysts for the synthesis were found to be relatively poor for the decomposition.

Thus from these experiments we may conclude:

(1) That the primary effect of promoters on the iron catalysts is to increase the number of atoms upon which decomposition takes place.

(2) That the effects of heat treatment and poisoning on the catalyst is to decrease the number of atoms upon which decomposition takes place.

(3) That neither poisoning, heat treatment nor promoter action sufficiently alters the quality or nature of the atoms upon which the reaction takes place to cause an appreciable change in E, the heat of activation.

It is also interesting to note that if further experiments now in progress in the laboratory should confirm our belief that this 40,000 calories represents closely the true heat of activation for the decomposition of NH_3 on the iron catalyst, and that our value corresponds to the 39,000 calories found by Hinshelwood for the heat of activation for the decomposition of NH_3 on tungsten, and to the true heat of activation of NH_3 on platinum calculated by H. S. Taylor to be not less than 43,000, it would indicate that the true heat of activation may be a function only of the reacting gas and not of the catalyst present.

C. H. KUNSMAN

FIXED NITROGEN RESEARCH LABORATORY,
BUREAU OF SOILS,
U. S. DEPARTMENT OF AGRICULTURE

A CRITICAL FACTOR IN THE EXISTENCE OF SOUTHWESTERN GAME BIRDS

COMPLAINT is continually made, on the part of both sportsmen and bird lovers, that despite all sorts of protective measures the wild quail in many districts of California are disappearing. Even in localities which have been set aside under public or private auspices as game refuges, and where prohibition of shooting is enforced, this diminishment in the numbers of quail continues to be reported.

Sportsmen are prone to ascribe the disappearance of game birds, where living conditions otherwise remain seemingly favorable, to the activities of so-called "vermin" of various kinds, giving little weight to the fact that in most parts of the country said "vermin" (hawks, owls, foxes, wildcats, etc.) have also become greatly depleted since the time when the original balance prevailed.

In casting about for some cause to hold responsible for the diminishment noted in such birds as the California quail, the student of natural history may properly proceed to check off the various factors known by him to bear importantly upon the existence of the species in question, one by one, and see what may be left. On certain brush-land areas in southern California, familiar to the writer now and thirty years ago, I am quite sure of the following conditions: (a) The food supply remains, in so far as I can see, in both kind and amount about the same; (b) shelter, that is, "cover," is of quite the same character and quantity as formerly; (c) natural enemies are most certainly fewer in individual numbers and hence levy less of a draft on the quail population than formerly; (d) hunting by man has in large measure been done away with on the particular territories in question.

Sportsmen and some biologists have stressed the probability of some disease having invaded the quail population. Upon this question I have nothing worth

serious consideration to offer one way or the other, save to point out the opportunity afforded for infection by domestic birds of drinking places accessible on country farms to wild game. However, my present inclination is to minimize the chances of this sort of factor entering into the present problem.

Then what critical factor *does* remain, to account for the marked decrease of the quail, even where general conditions remain altogether favorable?

I originally got the idea set forth in the following paragraphs from a sportsman long resident in Marin County, north of San Francisco Bay. It involves a factor active chiefly, but nevertheless vitally, in a very short segment of the life cycle of our quail. Briefly, a brood of newly hatched quail must find itself within walking distance (walking distance, be it emphasized, for the *little* quail) of water to drink by them, within a few hours of hatching. Anticipating this need, the old quail seek nesting sites accordingly. For without water the young are doomed to perish, *if* time of hatching happens to fall within a rainless or dewless period of weather. Failing to find such a propitious site, the nesting of a given pair of quail is a failure for that season.

Throughout the southwestern United States the thing of very greatest economic demand by the rapidly increasing human population is, not land, not minerals, not timber, but *water*. Every surface trickle, in every foothill ravine, which will yield water at the close of the rainy season, usually in April, and throughout the long late spring and summer dry season, is being tapped. At first the surface water is led off by pipe line to the thirsty ranch below. But a next step quickly follows: The seepage is tapped underground, a tunnel being driven in, and the water is drained from the porous rock or bed of sand below the surface. Then the mouth of the tunnel is screened, for the very purpose of keeping out animals of all sorts (so as to prevent "contamination"). In other words, the natural water supply, under original conditions provided at the surface, and accessible to the water-dependent wild animal life in the vicinity, has disappeared. It is only available, at best, in the very near vicinity of some human habitation far below, to which the pipe line leads, but where house cats, dogs and human beings prevent safe approach by quail. Not only for the thirsty youngsters but for the adult quail the original watering place has vanished.

There is, I believe, a critical distance, which, rain or dew failing, is the absolute limit a quail's nest may be located from safely accessible water and result in a matured brood. I estimate, from an accumulation of impressions (I grant) of my own, that maximum distance to be 400 yards. *If* a pair of quail can not find suitable cover and safety for its nest within that distance from water which will be accessible by the newly hatched young on foot, either the attempt is abandoned or that nesting is destined to failure. The common observation that few quail are raised in years of severe drouth supports this idea.

Immediate accessibility to water under conditions of safety, on the part of the little quail before they acquire wing power which will enable them to go long distances between forage grounds and possible drinking places, is then, I think, the prerequisite to maintenance of our quail and certain other upland game birds, even where all the other critical factors are favorable. And that factor of water supply, in the breeding season of the quail, is the one which, under the stress of human population growth, is becoming more and more the determining one. Properly safeguarded watering places are becoming fewer and fewer, with the inevitable result that large tracts of foothill brush-land otherwise suitable for the support of an abundant quail population come to lie untenanted by these esthetically attractive and recreationally valuable game birds.

The water supply available in the dry season is a factor delimiting not only human but certain other vertebrate populations in the arid southwest.

JOSEPH GRINNELL
MUSEUM OF VERTEBRATE ZOOLOGY,
UNIVERSITY OF CALIFORNIA

SOCIETIES AND ACADEMIES

THE FEDERATION OF AMERICAN SOCIETIES FOR EXPERIMENTAL BIOLOGY

THE Federation of American Societies for Experimental Biology in conjunction with four other societies, namely the American Association of Pathologists and Bacteriologists, American Association of Immunologists, American Association for Cancer Research and the International Association of Medical Museums, held the annual meeting at the University of Rochester and Strong Memorial Hospital from April 14 to 16, 1927. It is the first time since 1918 that the Federation held its meetings at a time other than the Christmas holidays. The attendance was so high and the number of papers presented so numerous and of such character that most of those attending consider the spring meeting a great success. It was so successful that councils of the four societies constituting the Federation unanimously voted to continue the experiment for another year.

At the last joint session the Federation as a body formally extended to the Medical School of the Uni-

versity of Rochester and to the local committee a unanimous vote of thanks for the very efficient manner in which the numerous details necessary for the success of the meeting had been cared for and for the very cordial reception experienced by all attending.

The executive committee of the Federation chose Ann Arbor as the meeting place for the spring of 1928.

Another important matter brought before the four societies of the Federation was the arrangements to be made in connection with the holding of the Thirteenth International Physiological Congress in the United States in 1929. It was agreed that the Federation as a whole would take over the management of this important event. The first step taken was to choose a national committee of four physiologists, three biochemists, two pharmacologists and two pathologists. This committee has met already and one of the important decisions made is that the congress is to be held at Harvard.

The Rochester meeting was held with Dr. E. C. Kendall, president of the American Society of Biological Chemists, as chairman. At next year's meeting Dr. Carl Voegtlin, Hygienic Laboratory, Washington, D. C., president of the American Society for Pharmacology and Experimental Therapeutics, will be the chairman and Dr. E. D. Brown, University of Minnesota, will act as general secretary.

F. C. KOCH,
General Secretary

UNIVERSITY OF CHICAGO

AMERICAN SOCIETY FOR PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS

THE eighteenth annual meeting of the American Society for Pharmacology and Experimental Therapeutics was held at the University of Rochester Medical School, Rochester, N. Y., on April 14, 15 and 16.

The first meeting was a joint session of the four societies which conjointly form the Federation of American Societies for Experimental Biology. Sessions of the Pharmacological Society were held on the afternoon of the same day and during the two days following.

There was no one paper presented which might be selected as possessing unusual merit, but the papers as a whole were good and a liberal discussion followed the reading of each paper.

The attendance was unusually large and it was felt that this was in a large measure due to the change in time for holding the annual meeting which had heretofore been held during the Christmas holidays.

At a business meeting of the society, the following officers were elected:

President, Dr. Carl Voegtlin, Washington, D. C.
Secretary, Dr. E. D. Brown, Minneapolis, Minn.
Treasurer, Dr. A. L. Tatum, Chicago, Ill.

Ten new members were elected to membership in the society.

The medical school of the University of Rochester, where all the meetings were held, was found to be well adapted for our use and everything was provided in the way of equipment for the presentation of papers and demonstrations.

The local committee received a vote of thanks for the able manner in which they had provided for our comforts while guests of their city. They are to be commended for their efforts which contributed in a large measure to the success of the meeting.

E. D. BROWN, M.D.,
Secretary.

THE OHIO ACADEMY OF SCIENCE

THE Ohio Academy of Science held its thirty-seventh annual meeting at the Ohio State University, Columbus, on April 15 and 16, 1927, under the presidency of Dr. William McPherson. The attendance was unusually good, there being 125 at the annual banquet on Friday evening.

The Academy was unusually well favored this year in the matter of "invitation speakers" in that it had the opportunity of hearing Dr. Robert A. Millikan, of the California Institute of Technology, in one or two lectures on the general theme "Twentieth Century Discoveries in Physics," and Dr. C. E. McClung, of the University of Pennsylvania, on "The Mechanism of Heredity," each an outstanding scientist in his field.

In addition to these unusual lectures, the members of the Academy prepared and presented some 81 papers on various topics; of these 81 papers, 10 were presented in general session, 11 in the zoology section, 19 in the botany section, 20 in the geology section, 11 in the medical sciences section and 10 in the psychology section. In addition, some eight or nine interesting demonstrations and exhibits were offered, one of which, the wild flowers of Ohio by Mr. William Kayser, was notable.

Sixty-one new members were elected and seven members were raised to the rank of fellow in the academy. The following officers were elected for the ensuing year: *President,* Harris M. Benedict, University of Cincinnati, Cincinnati; *secretary,* William H. Alexander, U. S. Weather Bureau, Columbus; *treasurer,* A. E. Waller, Ohio State University, Columbus.

WILLIAM H. ALEXANDER,
Secretary